

## **Regional source rock maturation and petroleum migration of the Kurdistan Region, Iraq**

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### **ABSTRACT**

During the last decade the Kurdistan region of Iraq has been one of the global exploration hot-spots. Almost 70 new-field wildcat wells have been drilled adding some 10-15 billion barrel oil-equivalent reserves. The exploration success rate has been varied between 48-70% in the foldbelt and foreland settings. Despite several new publications on source rock parameters, structural styles, timing of folding and petroleum migration; challenges remain in understanding the timing of source rock maturation and petroleum migration into the individual structures that form the discovered fields and potential future prospects.

This study is an attempt to create a 3D basin and petroleum systems model for the Kurdistan Region. It investigates the lateral variations in source rock quality, thickness and maturity; focusing on the timing of structuration from the complex High Folded and Thrust Zones in the northeast towards the Low Folded Zone in the southwest.

A detailed 3D basin model covering Kurdistan was established using published regional depth and thickness maps of all penetrated stratigraphic mega-sequences. It was then modified thoroughly based on the available well-tops, cross-sections and surface geologic maps. As a result, it was possible to calculate the generated volume of petroleum from the drainage area of each trap or tectonic zone, and the timing of main trap formation versus petroleum migration.

Using the source rock maps, the total generated petroleum of the Low Folded Zone was calculated to be around 1,400 BBOE (billion barrel oil-equivalent), mainly sourced from the Sargelu and the Chia Gara formations. The amount of generated gas increases towards the Iranian border in the southeast area of Kurdistan, due to greater burial.

The Kurdistan High Folded Zone is an area with very high uncertainty and lower confidence in the depth and thickness maps, due to the existence of higher and steeper anticlines that have been subjected to higher and more varied erosion. The total petroleum volume generated in the High Folded Zone is around 1,200 BBOE, with the main contribution from the Chia Gara Formation. However, most of the generated petroleum volume was probably lost during the Neogene tectonic phases via thrusting and folding events, but still some large fields may occur within this zone, indicating active recent petroleum migration. Because of the complex geometries, the 3D model did not include thrusts and repeated sections within the Thrust Zone.